Development of a locomotor rating scale for testing motor function in sheep.

Journal: J Pediatr Surg

Publication Year: 2015

Authors: Erin G Brown, Benjamin A Keller, Christopher D Pivetti, Nicole A Sitkin, Aijun Wang, Diana L Farmer, Jacqueline C Bresnahan

PubMed link: 25840074

Funding Grants: UC Davis Stem Cell Training Program

Public Summary:
BACKGROUND/PURPOSE: Research to cure paralysis associated with myelomeningocele (MMC) is ongoing using the fetal sheep model of MMC. Despite decades of research using this model, no standardized motor function assessment exists. The purpose of this study is to develop a sensitive and reliable locomotor scale for assessing the functional status of sheep. METHODS: Twenty lambs were used to develop and validate the locomotor scale. Lambs (n=15) underwent a surgically created MMC defect at gestational age (GA) 75 days, followed by repair with various methods at GA 100. One lamb underwent a sham operation (n=1). Normal lambs (n=4) served as controls. All lambs were born via spontaneous vaginal delivery, and motor function was assessed for 24 hours. A locomotor rating scale was developed based on behavioral observations of lambs. Inter-rater reliability testing was performed to determine if the scale could be reliably applied by different raters. RESULTS: Observations led to the definition of 7 categories of locomotor recovery. A scoring system was developed to rank these categories. The scale captured a wide variety of neurologic outcomes. Inter-rater reliability revealed minimal variability between examiners (average standard deviation ±0.431). The average score for all raters was within 1 point of the consensus score 100% of the time. CONCLUSIONS: The sheep locomotor rating scale is capable of capturing subtle differences in neurologic function with minimal inter-rater variability. We propose a standardized rating scale for neurologic outcomes and believe this is a critical component for assessing the validity of experimental treatments to cure paralysis in MMC.

Scientific Abstract:
BACKGROUND/PURPOSE: Research to cure paralysis associated with myelomeningocele (MMC) is ongoing using the fetal sheep model of MMC. Despite decades of research using this model, no standardized motor function assessment exists. The purpose of this study is to develop a sensitive and reliable locomotor scale for assessing the functional status of sheep. METHODS: Twenty lambs were used to develop and validate the locomotor scale. Lambs (n=15) underwent a surgically created MMC defect at gestational age (GA) 75 days, followed by repair with various methods at GA 100. One lamb underwent a sham operation (n=1). Normal lambs (n=4) served as controls. All lambs were born via spontaneous vaginal delivery, and motor function was assessed for 24 hours. A locomotor rating scale was developed based on behavioral observations of lambs. Inter-rater reliability testing was performed to determine if the scale could be reliably applied by different raters. RESULTS: Observations led to the definition of 7 categories of locomotor recovery. A scoring system was developed to rank these categories. The scale captured a wide variety of neurologic outcomes. Inter-rater reliability revealed minimal variability between examiners (average standard deviation +/-0.431). The average score for all raters was within 1 point of the consensus score 100% of the time. CONCLUSIONS: The sheep locomotor rating scale is capable of capturing subtle differences in neurologic function with minimal inter-rater variability. We propose a standardized rating scale for neurologic outcomes and believe this is a critical component for assessing the validity of experimental treatments to cure paralysis in MMC.